

The United States faces the potential for abrupt climate change in the 21st century that could pose clear risks to society in terms of our ability to adapt.

These changes in climate and related environmental systems can occur over decades or less, persist for decades more, and cause substantial disruptions to human and natural systems.

A 2008 report from the U.S. Global Change Research Program (USGCRP) / Climate Change Science Program (CCSP), [Abrupt Climate Change](#), drew the following conclusions about the prospects for abrupt changes over the next century:

- Climate model simulations and observations suggest that rapid and sustained September arctic sea ice loss is likely in the 21st century.
- The southwestern United States may be beginning an abrupt period of increased drought.
- It is very likely that the northward flow of warm water in the upper layers of the Atlantic Ocean, which has an important impact on the global climate system, will decrease by approximately 25–30 percent. However, it is very unlikely that this circulation will collapse or that the weakening will occur abruptly during the 21st century and beyond.
- An abrupt change in sea level is possible, but predictions are highly uncertain due to shortcomings in existing climate models.
- There is unlikely to be an abrupt release of methane, a powerful greenhouse gas, to the atmosphere from deposits in the earth. However, it is very likely that the pace of methane emissions will increase.

A 2009 report from the USGCRP/CCSP titled [Thresholds of Climate Change in Ecosystems](#) examined abrupt changes in biological systems. One example cited in the report in which a biological threshold has already been crossed is the relatively sudden outbreak of spruce bark beetles that has occurred across parts of the western United States. This has been caused in part by the increase in winter temperatures above a threshold that has greatly enhanced the over-winter survival of the beetles. Another example of an ecosystem threshold is the coral bleaching that occurs above certain levels of ocean acidity and temperature.

According to this report, in order to better understand and prepare for ecological threshold crossings and their consequences, it is essential to increase the resilience of ecosystems and thus to slow or prevent the crossing of thresholds; to identify early warning signals of impending threshold changes; and to employ adaptive management strategies to deal with new conditions and new combinations of species.

